

# Quality of sleep and associated factors among people living with HIV/AIDS on follow up at Ethiopian Zewditu Memorial Hospital,2018

**Nebiyu Mengistu**

Dilla University

**Telake Azale**

University of Gondar

**Solomon Yimer** (✉ [sopsycha@gmail.com](mailto:sopsycha@gmail.com))

Dilla University <https://orcid.org/0000-0003-0110-3792>

**Mahilet Fikreyesus**

Amanuel Mental Specialized Hospital

**Elsa Melaku**

Amanuel Mental Specialized Hospital

**Seid Shumye**

Dilla university

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## Research

**Keywords:** HIV/AIDS, Sleep habits, AIDS, Sleep hygiene, Prevalence Studies

**Posted Date:** September 12th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-26745/v2>

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**Version of Record:** A version of this preprint was published on January 4th, 2021. See the published version at <https://doi.org/10.1186/s41606-020-00056-w>.

# Abstract

**Background:** Sleep disturbance is a common complaint in people living with HIV/AIDS. Individuals with it are less likely to adhere to their treatment, have decreased quality of life, have decreased work productivity, and have increased risk of psychiatric disorders, cardiovascular morbidity, and disease progression. However, sleep condition remains under-recognized by clinicians and is not well studied in Ethiopia. Therefore it is necessary to produce scientific evidence to fill the clinical knowledge gap and recommend the focus area of management. The aim of the study was to assess sleep quality and its associated factors among people living with HIV/AIDS.

**Methods:** An institution-based cross-sectional study was utilized among 408 participants who were selected by a systematic random sampling technique at Zewditu memorial hospital from April to May 2018. The Pittsburgh Sleep Quality Index questionnaire was used to measure sleep quality. Ethical clearance was obtained from the joint ethics committee of the University of Gondar and Amanuel Mental Specialized Hospital. Oral informed consent was obtained from each participant. Binary and multivariable logistic regression models were fitted. Odds ratios (OR) with the corresponding 95% confidence interval (95%CI) was computed to assess the strength of the association.

**Results:** The magnitude of poor sleep quality was 55.6%. Being female [AOR=3.40, 95% CI: (1.80, 6.41)], depression [AOR =3.52, 95% CI: (1.95, 6.32)], CD<sub>4</sub>count  $\leq$  200 cells/mm<sup>3</sup> [AOR=3.18,95%CI: (1.65,6.13)], duration of HIV/AIDS diagnosis [AOR=3.43,95% CI: (1.61,7.29)], current use of tobacco [AOR=5.69, 95% CI: (2.04,15.9)] and chat or caffeinated drinks [AOR=2.65, 95% CI: (1.06,6.64)] and poor sleep hygiene [AOR=3.55, 95% CI: (1.85, 6.78)] were significantly associated with poor sleep quality.

**Conclusions:** More than half of the study participants were found to have poor sleep quality. A range factors influence quality of sleep of people with HIV/AIDS. Routine screening of sleep condition among people living with HIV/AIDS and early intervention based on the findings is suggested.

## Background

Sleep is a natural process that the brain requires to keep proper functioning and maintain the health of the human body. Sleep occupies one third of human life and its deprivation causes negative consequences that may be physical, cognitive, or emotional. Suffering from inadequate sleep has been associated with chronic medical illness like diabetes, stroke, heart disease and Human immunodeficiency virus or Acquired immune deficiency syndrome (HIV/AIDS) [1, 2].

HIV/AIDS is a chronic, potentially life threatening condition caused by the HIV, which affects mostly the immune system and nervous system. It's among the most overwhelming health problems throughout the world and especially in developing countries [3]. It is estimated that 36.7 million people are living with HIV/AIDS in the world. In Ethiopia, the national adult HIV/AIDS prevalence has been reported to be 1.14%. It has been estimated that 542,121 adults and 178,500 children require antiretroviral treatment in Ethiopia [4]. Sleep disturbance is one of the most prevalent symptoms in individuals infected with HIV/AIDS where

40% to 70% of individuals infected with HIV/AIDS are reporting significant sleep disturbances, including difficulty falling asleep, awakenings during the night, and reduced sleep time [5-7].

Sleep disturbance among people living with HIV/AIDS occurs throughout the stages of the infection, but more prevalent in the advanced stage. Despite this fact, still it receives little attention[8]. This may be, because it is considered as a normal consequence of the disease and its treatment, or considered to be insignificant in comparison with other complications of HIV infection [9].

But sleep deprivation among people living with HIV/AIDS leads to various effects, such as impaired immune system, hampered physical performance, affected cell growth and repair, deteriorated neuronal connections and neuronal malfunctions [10]. In addition, it may also increase the risk of cardiovascular morbidity and mortality, and the degree of suffering with psychiatric disorders [11].

According to study results, sleep disturbance is not only prevalent, but also there are more intense and distressful symptoms experienced by the HIV population. As a result, such individuals are less likely to adhere to their antiretroviral therapy regimens probably as a result of depression [6, 12-14].

A cross-sectional surveys conducted in China and France showed that prevalence of sleep disturbances and Poor sleep quality was 43.1% and 47% respectively. Prevalence of sleep disturbances differed significantly between those who suffered anxiety and depression and those who did not. Moreover, being male, a smoker, living single, being unemployed or moderately or seriously depressed were significantly associated with poor sleep quality [15, 16].

According to a survey conducted in Latin America countries Mexico and South East Brazil 58.6% and 46.7% had poor sleep quality respectively. Depressive symptoms, illicit drug use, a CD4 count < 200 cells/ $\mu$ l, and longer duration of HIV/AIDS diagnosis was positively associated with poor sleep quality[17, 18].

Similarly, studies conducted in Nigeria among HIV-positive outpatients reported that 46.2% in University of Calabar Teaching Hospital and 59.3% in Lagos State University Teaching Hospital had sleep disorders and poor sleep quality respectively. Elevated systolic blood pressure, shorter duration of HIV diagnosis and HAART type were associated with sleep disorders and poor sleep quality [19, 20].

Despite this significant health problems and higher prevalence, sleep quality among people with HIV/AIDS remains under-studied with no published study in Ethiopia. Therefore, the aim of this study was to assess the magnitude of sleep quality and it's among people living with HIV/AIDS in Zewditu Memorial Hospital, Ethiopia.

## Methods

### Study design, period, setting, and population

An institutional-based cross-sectional study was conducted from April to May 2018 in Zewditu Memorial Hospital which is found in Addis Ababa, Ethiopia. CDC-Ethiopia helped launch an Ethiopia's first ART

program at ZMH in July 2003, and in March 2005 it received technical assistance from Johns Hopkins University's (JHU) TSEHAI Program. ZMH became the largest HIV clinic in Ethiopia and a leading hospital in the treatment of ART patients. Currently, it treats over 7299 each month. There were 17,857 HIV-positive patients having HIV care follow-up in the hospital in 2018. The study population was patients who were attending at ART clinics during the data collection period. All adults who were seriously ill and unable to communicate were not included in the study.

### Sample size and sampling technique

Sample size (n) was calculated based on single population proportion formula, by assuming 95% confidence level, the prevalence of poor sleep quality among HIV/AIDS patients which was found to be 59.3% in Nigeria [20] and a precision of 5% between the sample and the parameter was taken.  $\alpha = 0.05(95\%) = 1.96$

$$n = \frac{\left(\frac{Z\alpha}{2}\right)^2 \times p(1-p)}{d^2}$$

$$d^2$$

$$n = \frac{(1.96)^2 \times 0.59(1-0)}{0.05^2} = 367$$

$$0.05^2$$

By considering a 10% non-response rate the final sample size was 408. We used a systematic sampling technique to select the four hundred eight (408) HIV/AIDS patients who were included in our survey. We determined the sampling interval by dividing the total study population who had to follow up during the average 1-month data collection period (3264) by total sample size (408). Hence, the sample interval is 8. We selected the first study participant by lottery method and the next study participants were chosen at regular intervals (every 8<sup>th</sup> interval) and interviewed by data collectors.

### Data collection tools and procedures

Data were collected by trained nurses by face-to-face interviewing of the participant (people who are HIV/AIDS positive and attending ART service). The questionnaire was pre-tested by taking 5% of the calculated sample size. The questionnaire contained socio-demographic characteristics (age, income, education, occupation, marital status, and others). Semi-structured questionnaires were used to collect data on clinical factors.

Data on the magnitude of sleep quality was collected by using the Pittsburgh Sleep Quality Index (PSQI), a self-report measure instrument composed of 19 items evaluating seven components of sleep. Each part was scored (range: 0-3; higher scores indicating worse sleep). A total global PSQI was derived by summing the seven components (range: 0 to 21; higher scores indicating poor sleep quality). A global PSQI score >5 yielded a diagnostic sensitivity of 89% and specificity of 86.5% ( $\kappa=0.75$ ,  $p \leq 0.001$ ) in

distinguishing “good” from “poor” sleepers. “Good sleep” was defined as global PSQI scores of 0-5 and “poor sleep” was global PSQI scores of 6-12[21].

Hospital anxiety and depression scale (HADS) were used to assess anxiety and depression. The HADS has two subscales: the anxiety subscale (HADS-A) and the depression subscale (HADS-D). It has a cutoff point  $\geq 8$  for each subscale [22]. HIV/AIDS related stigma scale was used to assess stigma. It is a 12-item screening tool developed by Annelies Van Rie, Sohini Sengupta. The tool has 4-point Likert response. Each items were scored with 0 (strongly disagree) and 3 (strongly agree). Participants who scored above the mean score were considered as stigmatized[22, 23].

Sleep hygiene index (SHI), a 13-item self-report measure designed to assess the practice of sleep hygiene behaviors. Each item is rated on a five-point scale ranging from 0 (never) to 4 (always). Total scores range from 0 to 52 with a higher score representing poor sleep hygiene[24]. Social support measured using Oslo 3 items social support scale (OSS-3)[25].

### **Data quality control issues**

Training was given to the data collectors and supervisors on the data collection tool and sampling techniques by the researcher. Supervision was held regularly during the data collection period both by the researcher, co-investigators and supervisors to check on a daily basis for completeness and consistency.

### **Analysis**

Data were analyzed using SPSS version 20. Description statistics (frequencies, proportions, means, and standard deviations) were used to present the sociodemographic and the prevalence of domestic violence. Both bivariate and multivariate logistic regression analysis were carried out to see the association of each independent variable with the outcome variable. A p-value of less than 0.05 was considered statistically significant, and an adjusted odds ratio with 95% CI was calculated to determine the association.

### **Ethical clearance**

Ethical clearance was obtained from the joint ethics committee of the University of Gondar and Amanuel Mental Specialized Hospital and Addis Ababa health bureau. The purpose and importance of the study were explained to each participant before they proceed into actual activities. Confidentiality was maintained by anonymous questionnaire and informed consent was obtained from each participant.

## **Results**

A total of 396 study participants were interviewed, giving a response rate of 97.1%. The mean age of the respondents was 38.57 years with SD ( $\pm 10.76$ ). The proportion of male to female participants was almost equal (50.3–49.7%). More than half of the client's 276 (69.7%) were Orthodox by religion and

most of the respondents were married 208 (52.5%) and regarding the education level of the respondents 176(44.4%) had attended secondary school (Table 1)

## **HIV related clinical characteristics of the participants**

Among the study participants, the majority 294(74.2%) was on clinical stage I, 219 (55.3%) had greater than 200 cells/mm<sup>3</sup> of CD<sub>4</sub> count, 296 (74.7%) on the first line regimen of ART drugs and 272 (68.7%) had duration of HIV/AIDS diagnosis greater than 10 years (Table 2).

## **Psycho-social characteristics of the participants**

According to psycho-social characteristics, more than half (51.5%) were depressed, 109 (27.5%) of the participants had general anxiety disorder symptoms, 194(49.0%) of them were stigmatized and 164 (41.4%) had poor social support. Among 197 female participants, 117 (59.4%) and of 199 males 87 (43.7%) had depression.

## **Behavioral characteristics of respondents**

The current use of substances among 396 study participants was 206 (52.0%). Among those with substance users, majority 183 (46.2%) use alcohol followed by 109 (27.5%) tobacco (Fig. 1).

## **Poor sleep quality and Factors associated among people with HIV/AIDS**

The magnitude of poor sleep quality among people living with HIV/AIDS was found to be 55.6%. Multivariable logistic regression revealed female sex, depression, CD4 less than 200 cells/mm<sup>3</sup> count, duration of HIV/AIDS diagnosis, current use of tobacco, current use of chat or caffeinated drinks and poor sleep hygiene were significantly associated with poor sleep quality.

The magnitude of poor sleep quality was found to be more than 3 times higher in females compared to males [AOR = 3.40, 95% CI: (1.80, 6.41)]. The odds of having poor sleep quality among depressed respondents were 3.52 times higher as compared to non-depressed respondents [AOR = 3.52, 95% CI: (1.95, 6.32)]. The odds of experiencing poor sleep quality among Participants with shorter duration of HIV diagnosis were more than three times as compared to those who had longer duration of diagnosis [AOR = 3.43,95% CI : (1.61,7.29)]. Similarly, Individuals whose CD<sub>4</sub> count were less than 200cells/mm<sup>3</sup> were 3.18 times more likely to develop poor sleep quality than individuals with CD<sub>4</sub> counts greater than 200cells/mm<sup>3</sup> [AOR = 3.18, 95% CI: (1.65,6.13)]. Regarding substances, those who smoke cigarette currently had 5.69 times more likely to develop poor sleep quality as compared with non-smokers [AOR = 5.69, 95% CI: (2.04, 15.9)]. In addition, those taking chat or caffeinated drinks 2.65 higher to have poor sleep quality as compared to those who didn't use [AOR = 2.65,95%CI: (1.06,6.64)]. Finally, The odds of were poor sleeps quality was 3.55 times higher among participants with poor sleep hygiene as compared to those with good sleep hygiene [(AOR = 3.55, 95%CI: (1.85, 6.78)] (Table 3).

## Discussion

This study was a first attempt to ascertain the magnitude of sleep quality and its possible association with various variables among people living with HIV/AIDS in Ethiopia. The results from the current survey revealed that a remarkable proportion of people living with HIV/AIDS had experienced poor sleep quality. More than half of the people living with HIV/AIDS (55.6%) experienced poor sleep quality. The magnitude of this study is in line with the studies conducted in Nigeria (59.3%), South Africa (55.8%), Indonesia (52%) and Mexico (58.6%) [17, 20–22].

Contrarily, the magnitude of poor sleep quality in this study was higher than study results in Brazil (46.7%) [18], Iran (47.5%) [23], China (43.1%) [15], Romania (42%) [24], Spain (40.9%) [25], France (47%) [16] and USA (26%) [26]. Furthermore the current finding is lower than the study conducted in USA 66.7% [27]. The possible reason the observed variation might be the difference in socio-cultural variations, variation in and hospital setting and caring modality.

In this study, poor sleep quality was significantly associated with female gender among people with HIV/AIDS. This could be due to the fact that females are more prone to stress due to the burden of excessive household responsibilities and changes in hormonal level. This result is supported by a study carried out in Nigeria [20].

The current study also found that depressed respondents were significantly associated with poor sleep quality as compared with non-depressed respondents. This may be due to depressed individuals have decreased serotonin neurotransmitters that results in diminished cognitive performance affects normal sleep pattern. This finding is in agreement with studies done in China [15], Europe and USA [16, 26–29]

CD<sub>4</sub> count less than 200cells/mm<sup>3</sup> were a significant factor to develop poor sleep quality among people with HIV/AIDS. Probably, immune system is directly linked to the brain by a complex network of nerves, hormones, and neuropeptides. This network of specific physiological pathways is the primary determinant of neuropathology to have a direct impact on health including sleep. The finding of this study coincides with a study done in Nigeria [19, 20] and Mexico [26].

Similarly, shorter duration of HIV diagnosis were significantly associated with poor sleep quality as compared longer duration of diagnosis. The possible reasoning might be HIV-positive patients feel stigmatized and this may contribute to frequent psychological stress and emotional disturbances. The result supported by research conducted in Nigeria [20].

Furthermore, use of substances within the current three months (i.e. tobacco, chat or caffeinated drinks) were significantly associated with poor sleep quality. The possible reasons behind these is biological effect of the substances on the brain results in disturbance of circadian rhythms which is associated with

symptoms of poor sleep quality. This finding agrees with a study conducted in France[16], US geographic areas [30, 31] and studies conducted in Ethiopia at community level[32, 33].

Finally, in the present study there is a strong relationship between poor sleep hygiene and poor sleep quality. Even if, the finding of this study has no corresponding literature among the same population, it's supported by study undertaken in India to identify the relationship between sleep hygiene practices and sleep quality among cancer patients [34].

## Conclusion

In summary, this study revealed that more than half of people living with HIV/AIDS were found to have poor sleep quality. Being female, diagnosis of depression, lower CD4 count, shorter duration of HIV/AIDS diagnosis, current use of tobacco, chat or caffeinated drinks and poor sleep hygiene were factors significantly associated with poor sleep quality. The findings suggest that routine screening of sleep disturbances among people living with HIV/AIDS is highly recommended. It's also better to integrate mental health program with HIV/AIDS assessment and ART service delivery programs.

## Abbreviations

AOR: Adjusted odd ratio; CI: Confidence interval; PSQI: Pittsburgh Sleep Quality Index

## Declarations

### - Ethics approval and consent to participation

Ethical approval was obtained from joint Ethical Review Committee of University of Gondar and Amanual Mental Specialized Hospital (No Committee reference number). Written consent was taken from the participants for their voluntary participation. Confidentiality was maintained throughout the study process.

**Consent to publication:** N/A

### - Availability of data and materials.

All data generated or analyzed during this study are included in this published article. The data sets of the current study is available from [Nebiyu Mengistu, email: [nebiyumen@gmail.com](mailto:nebiyumen@gmail.com) ; Mobile: +251931333504, Dilla university, Dilla] upon reasonable request

### - Competing interests

We declare that there is no any financial or non-financial conflict of interest

### - Funding

The sources of funding for the current research is from Amanuel Mental specialized Hospital. The funding organization did not have any role in the design of the study, collection, analysis, interpretation of data and in writing the manuscript.

### **Authors' contributions**

Nebiyu Mengistu ([nebiyumen@gmail.com](mailto:nebiyumen@gmail.com)) organized the original investigation; coordinated the collection of data; analysis and writing report. Telake Azale ([atelake07@gmail.com](mailto:atelake07@gmail.com)), Mahlet Fikreyesus ([mahifyf@gmail.com](mailto:mahifyf@gmail.com)) and Elsa Melaku ([elsa\\_mlk@yahoo.com](mailto:elsa_mlk@yahoo.com)) equally contributed to the design of the study, performed the statistical analyses, Solomon Yimer ([sopsycha@gmail.com](mailto:sopsycha@gmail.com)) and Seid Shumye ([Seidshumye22@gmail.com](mailto:Seidshumye22@gmail.com)) contributed to the statistical analyses, drafted the manuscript and revision of the Manuscript.

### **Acknowledgements**

We would like to thank Amanuel Mental Specialized Hospital, University of Gondar and Zewditu Memorial Hospital staffs for their support and assistance throughout the study process.

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## Tables

Table 1: Socio demographic characteristics of people living with HIV/AIDS on follow at Zewditu Memorial Hospital, Ethiopia, 2018.(n=396)

Variable	Category	Frequency	Percentage
Age(mean or SD)			38.57±10.76
Sex	Male	199	50.3
	Female	197	49.7
Religion	Orthodox	265	66.9
	Muslim	24	6.1
	Protestant	84	21.2
	Others*	23	5.8
Marital status	Single	166	41.9
	Married	208	52.5
	Others* *	22	5.6
Educational status	Can't write and read	20	5.1
	Primary	88	22.2
	Secondary	176	44.4
	Tertiary and above	112	28.3
Job of participants	Employed	154	38.8
	Private business	150	37.9
	Students	66	16.7
	Others ***	26	6.6
Living arrangement	with family	244	61.6
	alone	133	33.6
	Others****	19	4.8

N.B. \* Catholic, Wakifeta \*\* Separated, Divorced, widowed \*\*\* Daily laborer, House wife, Farmer \*\*\*\* with relatives, Adopted

Table 2. HIV related clinical characteristics of people living with HIV/AIDS on follow up at Zewditu Memorial Hospital, Addis Ababa, Ethiopia, 2018.

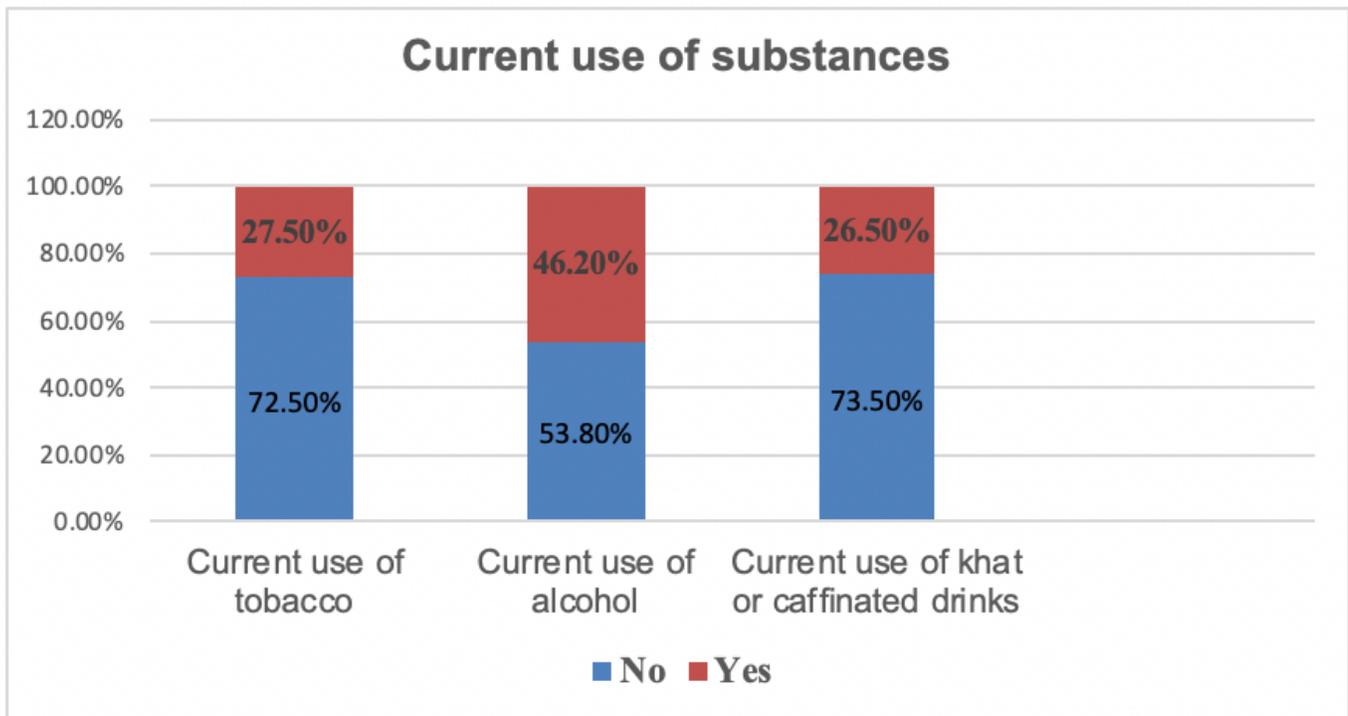
(n=396)

Variable	Category	Frequency(396)	Percentage
WHO clinical stage	stage I	294	74.2
	stage II	59	14.9
	stage III	35	8.8
	stage IV	8	2.0
CD <sub>4</sub> count	≤ 200 cells/mm <sup>3</sup>	177	44.7
	> 200 cells/mm <sup>3</sup>	219	55.3
Duration of HIV/AIDS diagnosis	≤ 10 years	124	31.3
	> 10 years	272	68.7
ART type	first line regimen	296	74.7
	Second line regimen	100	25.3
Co-morbid chronic medical illness	No	255	64.4
	Yes	141	35.6
Types of chronic medical conditions	Hypertension	47	33.4
	Diabetes mellitus	41	29.0
	Tuberculosis	35	24.8
	Others	18	12.7

Table 3. Factors associated with poor sleep quality among people living with HIV/AIDS at Zewditu Memorial Hospital (Bivariate and multivariate analysis) (n=396), Addis Ababa, Ethiopia, 2018.

Variables	Categories	sleep quality		COR(95%CI)	AOR(95%CI)
		Poor	Good		
Age				0.98(0.96,1.00)	0.98(0.95,1.01)
Sex	Male	75	124	1.00	1.00
	Female	145	52	4.61(3.00,7.06)	3.40(1.80, 6.41)**
Depression	No	72	120	1.00	1.00
	Yes	148	56	4.40(2.88,6.73)	3.52(1.95, 6.32)**
Anxiety	No	153	134	1.00	1.00
	Yes	67	42	1.39(0.89,2.19)	0.92(0.48,176)
Perceived stigma	No	78	124	1.00	1.00
	Yes	142	52	4.34(2.83,6.64)	0.82(0.39,1.76)
Social support	Poor	128	36	7.11(3.51,14.3)	2.48(0.91,6.75)
	Moderate	76	108	1.40(0.72,2.74)	1.20(0.50,2.88)
	Strong	16	32	1.00	1.00
CD <sub>4</sub> count	>200 cells/mm <sup>3</sup>	79	140	1.00	1.00
	≤200 cells/mm <sup>3</sup>	141	36	6.94(4.38,10.9)	3.18(1.65,6.13) **
Duration HIV diagnosis	>10 years	115	157	1.00	1.00
	≤10 years	105	19	7.54(4.37,13.0)	3.43(1.61,7.29) **
Co-morbid medical illness	No	111	144	1.00	1.00
	Yes	109	32	4.41(2.77,7.03)	0.67(0.28,1.62)
Current use of tobacco	No	123	164	1.00	1.00
	Yes	97	12	10.7(5.66,20.5)	5.69(2.04,15.9)**
Current use of alcohol	No	84	129	1.00	1.00
	Yes	136	47	4.44(2.88,6.83)	0.94(0.43,2.05)
Current use of chat or caffeinated drinks	No	140	166	1.00	1.00
	Yes	80	10	9.48(4.73,19.0)	2.65(1.06,6.64) *
Sleep hygiene	Good	84	109	1.00	1.00
	Poor	136	67	2.64(1.75,3.96)	3.55(1.85,6.78)**

## Figures



**Figure 1**

Current use of substances among people living with HIV/AIDS on follow up at Zewditu Memorial, Addis Ababa, Ethiopia, 2018(n=396).